PLC meeting date
December 7, 2011

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5th grade Science PLC

Focus on Energy

Investigating potential and kinetic energy with roller coasters

Special points of interest:

* Materials and resources are available for your use. Student instructional materials are located on the wiki under Energy. Lab equipment can be checked out from me at Midland.

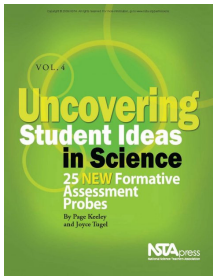
Students should design an experiment to illustrate the difference between potential and kinetic energy to meet GLE 0507.10.1. A fun way to facilitate this is to let them build roller coasters out of pipe insulation foam that you've split in half and masking tape. These flexible, u-shaped strips are long and easy to manipulate into loops, curves and jumps. My favorite way to teach this lesson is for the students to work in teams of two or three and to allow them to build their coaster ***prior*** to any instruction on energy. The students are challenged to create the "best" working roller coaster in the time allowed—with little or no guidance or constraints. You can tell them there must be one loop but I prefer to say nothing. Their designs are amazing. Be prepared for them to "borrow" classroom items, like books and chairs, and for the coasters to take over your classroom. It is so exciting to watch the students amend their designs as their understandings of potential and kinetic energy develop. For example, I saw several groups that had loops on the floor at the end of their coasters. They struggled with why the marble stopped and didn't travel around the loop. Some removed the loop altogether but most moved the loop closer to the beginning after a drop from a chair or the wall. I loved hearing them discuss their reasoning for the change with one another. After the time for building is up, have the students come together and do a gallery walk where each group demonstrates their coaster to the class. You can allow students to vote for the "best" coaster but I prefer to choose the winner myself. The coaster had to work when it was demonstrated for the class to be considered. Then I look for the level of complexity and honestly, coolness counts too. It takes considerable content knowledge to create a coaster with jumps where the marble leaves the coaster surface. I follow up with whole group discussion about what worked and didn't work and why. There's also a great applet that demonstrates the type of energy found at various places during the coaster ride. Scan the QR code to go to the website.

You will find that students have misconceptions about the conversion of potential energy to kinetic energy. Addressing these misconceptions is essential for students to move past them and on to correct science understandings.

For more information about uncovering student misconceptions, read the article below.

Inside this issue:

Uncovering Student Ideas in Science by Page Keeley and Joyce Tugel



Teachers use this assessment information to adjust instruction, monitor learning and determine when students are ready to demonstrate their learning. This type of formative assessment is like a thermostat. It regulates when, what type and how much instruction is needed on a topic based on classroom environmental conditions. Instruction without formative assessment is like leaving your heat pump constantly running. We would never do that because it is so inefficient. Formative assessment ensures instructional efficiency.

This type of assessment *for* learning is grounded in research and is based on one of the foundational ideas in *How People Learn: Brain, Mind Experience, and School*. "Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn for purposes of a test, but revert to their preconceptions outside the classroom" *Scan the QR codes below for PDF samples of the books.*

Scan the QR code for all of the SOS strategy guides.

Let's use our Seeds of Science books!!

Hurry to your bookroom to find *It's All Energy.* Now, what is the best way to use this book in literacy to support what we are learning in science? First, let's print the strategy guide to help us understand the dual purposes behind the book—there's a specific literacy learning target as well as one for science. Here's the strategy guide. Scan the QR code. (And if you don't have a QR reader on your phone, I downloaded the free app QRReader, but there's several good ones out there.)

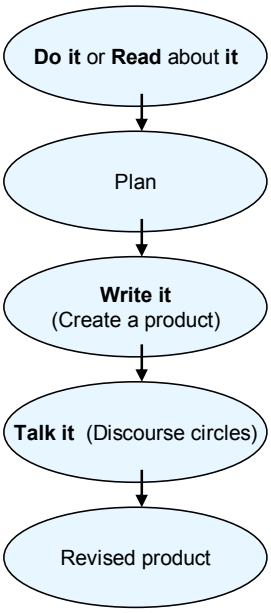
Here's suggestions from my meetings with Krissy Turner for using the SOS books in your literacy reading groups:

- Students need to read informational text in order to understand how to create their own expository pieces. Students can use a Frayer model to record information as they read.
- The reading level of the book is not important. Your instructional strategy will vary based on the students' reading levels. Use shared reading for above level books, guided reading for on level books and independent reading for below level books.
- Choose books that correlate with the science instruction. In groups, students use the books as they would any other expository piece. Discussions about text structure, main idea, inference, idioms, multiple meaning words, etc. are specific literacy lesson targets found in the SOS books.

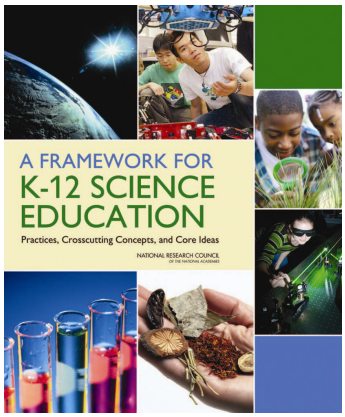
For writing groups:

- Planning for writing an expository piece is very different from planning a narrative piece.
- Investigations from science can be used to plan and write an informational text piece. Investigations also provide students with wonderful experiences from which to write an opinion/persuasive piece.
- Every published piece should have some type of visual representation. Examples include graphs, figures, diagrams, tables or charts. Just as illustrations and art enrich narrative text, representations are imperative for meaning in expository text.

The process for an expository product is:



National Research Council's K-12 Science Education Framework and Next Generation Science Standards (NGSS)



Common Core Math and Literacy standards are available and ready to implement. So what's going on with science and common core? That is a good question! Things are moving a little differently with how the new standards are being written for science. The field of science is changing at an unprecedented pace so creating standards that reflect the most current research requires the input of the top scientists in the nation. Those scientists exist within the National Academies of Science. Even though the title includes "National," the NAS is a private organization. The reason is to keep the science pure and without influence from the government or any other entity. The NAS was formed by Abraham Lincoln by congressional charter in 1863 to provide independent advisement on matters of science. That is its role today as well. As this role grew, the NAS grew and in 1916, the National Research Council was added to serve as the policy arm of the NAS. The NRC ensures separation between the research and policy areas of the NAS. *Scan the QR code for more information on the NAS and NRC.*

Last year, the NRC was tasked with creating a framework for K-12 science education. The joke was they were hiding out in some bunker for a year and hashing out what science education must include in order for American students to be competitive in a global STEM economy. That wasn't too far from the truth. The top researchers in every field of science as well as science educators created the framework and it was released July 2011. This document provides the structure of what science education in the US will look like and is quite unlike science education today. It reflects the most current pedagogy of experiential science for students and strongly relies on developing problem solving abilities and critical thinking for students. But the framework is just that, a structure—the standards are not included in what the NRC created. They were tasked to provide WHAT students need to be able to do, not HOW. The standards that come from the framework will provide us with how students will know and be able to do the science within the framework. *Scan the QR code for a summary of the K-12 Framework.*

The development of standards from the NRC framework is now the job of Achieve.org. If that name sounds familiar it is because Achieve was created in 1996 by governors and began the American Diploma Project. That project is what has driven the development of national standards for all disciplines through the Common Core State Standards Initiative. Achieve is five months into the process of developing the Next Generation Science Standards or NGSS. Science won't be called common core because of the designation of being a set of privately, not governmentally, developed standards but they are national standards just like common core.

The NGSS are based upon students developing scientific ***practices***. I love the use of that word because that is inherently what all science involves, a scientific mindset involving abilities under constant and continual refinement. Practice implies an ongoing, dynamic process whereas skills or activities are static and rote. I've heard Stephen Pruitt, Achieve's vice president, speak several times about the NGSS and his vision is exciting. The goal is to have strong content resources linked to every standard so educators can quickly embed technology in meaningful ways into their lessons. Also, he envisions a storehouse of lesson plans with networking to connect educators nationwide. The NGSS will have two public reviews, one this winter and one in the spring, where input is gathered for revisions. Final release is scheduled for December 2012. *Scan the QR code for more information on NGSS*